VIDEO CODING WITH HELPER DATA FOR SPATIAL INTRA-PREDICTION

TECHNOLOGICAL FIELD

[0001] The described invention relates to processing of digital images and videos, and particularly to encoding and decoding of such images and video for telecommunications and storage thereof.

BACKGROUND

[0002] Acronyms used herein are listed below following the detailed description. The recommended specifications ITU-T H.263 and H.264 (04/2015) provide typical hybrid video codecs in that they encode the video information in two phases. Firstly pixel values in a certain picture area (termed a "block") are predicted for example by motion compensation means or by spatial means. Motion compensation generally includes finding and indicating an area in one of the previously coded video frames that corresponds closely to the block being coded; spatial means generally includes using the pixel values around the block to be coded in a specified manner. Secondly the prediction error is coded; the prediction error is the difference between the predicted block of pixels and the original block of pixels. Coding the prediction error is typically done by transforming the difference in pixel values using a specified transform such as for example a Discreet Cosine Transform (DCT) or some variant of it, quantizing the coefficients and entropy-coding the quantized coefficients. By varying the fidelity of the quantization process, the encoder can control the balance between the accuracy of the pixel representation (the picture quality) and the size of the resulting coded video representation (the file size or transmission bitrate).

[0003] Another image/video coding standard is ITU-T H.265, also referred to as High Efficiency Video Coding HEVC). This approach builds intra frame sample prediction blocks using directional filtering, and projects the sample location of the sample to be predicted onto the reference row using a selected prediction direction, and also applies a 1-dimensional linear filter to interpolate a predicted value for the sample. For the case of directly horizontal or directly vertical prediction directions, one of the block boundaries is additionally filtered with a sample gradient based filter. HEVC also defines direct current (DC) and planar prediction modes. DC prediction calculates the DC component of the reference samples and uses that as a prediction for the samples within a block, whereas planar prediction calculates an average of two linear predictions to predict blocks with smooth sample surface.

[0004] From the above review it is clear that spatial intra prediction typically creates a sample prediction block based on decoded samples around the block. That approach is able to model certain kinds of structures in the block very well, but at the same time it fails to predict some common classes of textures. For example, the directional sample prediction is able to accurately model shapes that match with the supported prediction directions, but when moving further away from the reference samples the prediction tends to become less reliable and often some prediction error aligned with the selected prediction direction begins to appear. Embodiments of these teachings detailed more particularly below address this shortfall or the prior art and others.

SUMMARY

[0005] According to a first aspect of these teachings there is a method for decoding a video stream, the method comprising: receiving with an encoded video stream an indication of a prediction mode and an indication of one or more prediction helper values; while decoding the encoded video stream, calculating a predicted value for each of at least one sample based on the received indication of the prediction mode and on the received one or more prediction helper values; and tangibly outputting the decoded video stream to at least one of a computer readable memory and a graphical display, such that the decoded video stream that is output incorporates each of the at least one sample as decoded using the respective calculated predicted value.

[0006] According to a second aspect of these teachings there is a computer readable memory storing computer program instructions that, when executed by one or more processors, cause a host decoder device to perform actions directed to decoding a video stream. In this regard the actions include: receiving with an encoded video stream an indication of a prediction mode and an indication of one or more prediction helper values; while decoding the encoded video stream, calculating a predicted value for each of at least one sample based on the received indication of the prediction mode and on the received one or more prediction helper values; and tangibly outputting the decoded video stream to at least one of a computer readable memory and a graphical display, such that the decoded video stream that is output incorporates each of the at least one sample as decoded using the respective calculated predicted value.

[0007] According to a third aspect of these teachings there is an apparatus for decoding a video stream. The apparatus comprises at least one computer readable memory storing computer program instructions and at least one processor. The computer readable memory with the computer program instructions is configured, with the at least one processor, to cause the apparatus to perforin actions comprising: receiving with an encoded video stream an indication of a prediction mode and an indication of one or more prediction helper values; while decoding the encoded video stream, calculating a predicted value for each of at least one sample based on the received indication of the prediction mode and on the received one or more prediction helper values; and tangibly outputting the decoded video stream to at least one of a computer readable memory and a graphical display, such that the decoded video stream that is output incorporates each of the at least one sample as decoded using the respective calculated predicted value.

[0008] These and other aspects of the invention are detailed below with more particularity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is a schematic block diagram of a video encoder that uses the two-phase process of pixel prediction and prediction error as is known in the video coding arts.

[0010] FIG. **2** is a schematic block diagram of a generic video decoder for decoding the video encoded by the process of FIG. **1**, as is known in the video coding arts.

[0011] FIG. **3**A illustrates a convention used in FIGS. **3**B-D for sample locations of a prediction block corresponding to a reference sample in a control unit using a vertical-only prediction direction.